multi-decade pulse generator with selectable duty cycle

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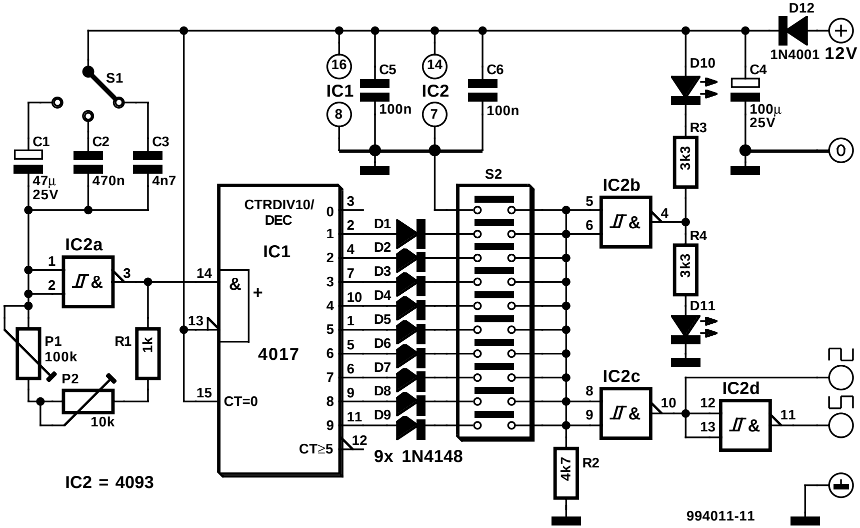
Many pulse generators with adjustable duty cycle have a significant drawback, in that the pulse repetition rate also changes when the duty cycle is adjusted. The circuit shown here avoids this problem. It uses a square wave generator consisting of IC2a and an RC network. Range switch S1 selects one of three RC combinations that control the pulse repetition rate. With the indicated values of C1, C2, C3 and P1, P2 and R1, there are three frequency ranges:

I) 0.1 Hz to 10 Hz
II) 10 Hz to 1 kHz
III) 1 kHz to 100 kHz

Note that the actual frequency depends on the hysteresis of the 4093, so that it is strongly dependent on the specific manufacturer and fabrication of the IC used. For this reason, P1 and P2 are provided for coarse and fine frequency adjustment, respectively, to allow the pulse repetition rate to be set exactly to the necessary value. If the desired frequencies cannot be obtained in spite of the wide adjustment range of the circuit, the capacitor values should be modified.



The square wave generator clocks a synchronous decimal counter. Each time the count is incremented, the associated decoded output goes high, while the remaining outputs stay low. DIP switch S2 allows several outputs to be connected to a single lead. The diodes prevent short-circuits between outputs selected by S2, whenever the outputs have differing signal levels. For a high/low ratio of 0.1, only the Q1 switch of S2 should be closed; for a ratio of 0.2 Q1 and Q2 should be closed, and so on. If all outputs of the 4017 (except for Q0) are selected, the resulting duty cycle is 0.9. The switch connected to earth can be closed to disable the PWM generator if all other switches are open.

The signal from the counter IC is connected to two inverters. Two LEDs are connected to IC2b. The lower the duty cycle, the brighter D11 shines and the dimmer D10. IC2b buffers (and inverts) the output signal of the circuit, and IC2d re-inverts the signal levels, so that two complimentary signals are available at the output. The current consumption of the circuit is around 4 mA.

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